(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 718 350 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent: **28.03.2001 Bulletin 2001/13**

(51) Int Cl.[7]: **C08K 3/04**, C08L 101/00 // (C08L101/00, 101:00, 101:00)

(21) Application number: **95306911.9**

(22) Date of filing: **29.09.1995**

(54) **Thermoplastic compositions with modified electrical conductivity**

Thermoplastische Zusammensetzungen mit modifizierter elektrischer Leitfähigkeit

Compositions thermoplastiques avec conductivité électrique modifié

(84) Designated Contracting States:
DE FR GB

(30) Priority: **22.12.1994 US 362040**

(43) Date of publication of application:
26.06.1996 Bulletin 1996/26

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(56) References cited:
EP-A- 0 272 541 **EP-A- 0 581 541**

- **DATABASE WPI Derwent Publications Ltd., London, GB; AN 89-211541 & JP-A-01 149 855 (UBE INDUSTRIES KK) , 12 June 1989**

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Description

Field of the invention

[0001] This invention relates to the use of a thermoplastic polymer blend whose electrical conductivity has been modified by means of the addition of electrically conductive carbon black for preparing moulded thermoplastic articles which one electrostatically pointed in a further step. More particularly, the blend comprises at least a crystalline polymer and an amorphous or semicrystalline polymer wherein at least a portion of the carbon black is dispersed within the amorphous or semicrystalline polymer.

Background of the invention

[0002] Electrostatic painting of substrates is desirable because it can reduce paint waste and emissions as compared with non-electrostatic painting techniques. Electrostatic painting techniques require the substrate to be electrically conducting or to have an applied precoat or primer which is electrically conducting, however, in order to display an increased paint transfer efficiency. Currently, injection moulded articles are generally made from thermoplastic materials like Xenoy or TPO which are electrically insulating. This quality of the material makes electrostatic painting of articles moulded from such resins more complex since an electrically conducting primer must be applied to the article prior to painting using this technique. Transfer efficiency using non-electrostatic techniques is less than 30% on Xenoy itself, whereas Xenoy having a coating of a conducting primer has a transfer efficiency during electrostatic painting approaching 55%. When using an electrically conducting primer, the path to ground is achieved via the conducting primer. This pathway in Xenoy articles is not at all well defined and is attributed to wrap of the primer around the rear of a supported part to a grounded buck. An alternative technique is to use a grounding clip. This undesirably causes higher film builds near the grounding clip with film builds decreasing as the distance from the grounding clip increases. In addition, after several passes through the paint booth, significant resistance to ground may be encountered due to multiple paint layers on the buck itself.

[0003] It would be desirable if the electrical conductivity of the substrate bulk material itself could be increased. This would overcome problems associated with electrostatically painting articles whose electrical conductivity is provided only through a conductive primer or prep coat. One solution might be to incorporate additives into the thermoplastic polymer to increase its bulk conductivity. Additives which might be incorporable in other types of polymer, e.g., stainless steel fibres in polyolefin polymers, are not suitable in thermoplastic polymer blends such as TPO or Xenoy because of a degradation of their desirable mechanical properties such as impact strength and tensile elongation, as well as a significant increase in the brittleness of the modified polymer blend.

[0004] It has been proposed in EP-A-0 272 541 and EP-A-0 581 541 to incorporate electrically conductive carbon black in a moulded thermoplastic article comprising a polymer blend of a crystalline and an amorphous or semi-crystalline polymer to improve the electrical conductivity of the article, but in neither of these specifications is this proposal considered in relation to electrostatic painting.

Summary of the invention.

[0005] The present invention is based on the discovery that a thermoplastic composition comprising a particular plastic blend and having particular values of both internal (core) conductivity and surface conductivity is particularly well adapted for articles which are to be electrostatically painted.

[0006] According to the invention, an electrically conductive composition having the characteristics set forth in claim 1 is used as material for moulded thermoplastic articles which are electrostatically painted in a further step. The invention also provides such articles which have been electrostatically painted.

Detailed description of preferred embodiments.

[0007] The composition used in accordance with the invention comprises a polymer blend of at least two polymers, one being a crystalline polymer having a melting point above 110°C, and the other polymer being an amorphous or semi-crystalline polymer having a Tg above -80°C and a percent crystallinity between 0 and 20 percent. The crystalline polymer may be selected from a wide variety of such polymers, preferably, but not limited to crystalline polymers such as polypropylene, polybutylene terephthalate, polyethylene, polyethylene terephthalate, nylon, polyphenylene sulphide, polyether ether ketone, and mixtures thereof. More preferably, the crystalline polymer, when making articles such as automotive fascia, is polypropylene, polyethylene, or terephthalate polybutylene. The amorphous or semi-crystalline polymer, having the characteristics described above, may be any such polymer preferably being one such as polycarbonate, natural and synthetic polyisoprene rubbers, ethylene-propylene copolymers (EPM), ethylene-propylene diene rubbers (EPDM), chlorinated rubbers, nitrile rubbers, polystyrene, polyphenylene oxides, methylmethacrylate styrene-butadiene block copolymers, polyether sulfones, polysulfones, polyarylates, other impact modifiers such as styrene-butadiene block copolymer, and mixtures thereof.

[0008] The crystalline polymer is at least about 35 weight percent of the polymer blend and is present as a continuous phase within the polymer blend. By continuous phase within the polymer blend is meant this

component of the blend forms an infinite or percolating structure within the blend. The terminology of continuous and dispersed phases can be defined as follows. Beginning with a single polymer system, particles of a second polymer are added. At low concentrations, the second polymer is defined as being dispersed in the first. As the concentration of dispersed particles increases, dispersed particles will be placed close enough to each other to be regarded as connected. Increasing the concentration of this dispersed polymer further eventually leads to larger groups of associated particles until continuity is established throughout the first polymer. In our case, the crystalline polymer will be a continuous, or connected phase, throughout the blend when its concentration in the blend reaches a critical concentration, usually in the 35 weight percent range or higher. Preferably, the crystalline polymer is at least 40 weight % of the polymer blend, more preferably being between 50 and 70 weight % of the blend. As the weight percent of crystalline polymer increases, the impact resistance decreases and the material becomes stiffer. Examples of particularly preferred blends for automotive fascia and exterior trim components are Xenoy, a blend of polybutylene terephthalate, impact modifier, and polycarbonate, and TPO, a blend of polypropylene and a rubber material which can be an ethylene-propylene copolymer.

[0009] Still other materials may be included in the composition along with the crystalline polymer and amorphous polymer, in a minor proportion by weight, to further modify its properties. Examples of such materials may be polymers like polypropylene-g-anhydride, ethylene-propylene-anhydride copolymers, graft copolymers of isotactic polypropylene and ethylene-propylene copolymers, or other compatibilizers. Still other materials which might be advantageously included in the composition are inorganic fillers such as calcium carbonate, $CaCO_3$, talc, or hydrated aluminium oxides, Al_2O_3.

[0010] Another required component of the composition, in addition to the polymer blend, is electrically conductive carbon black. This electrically conductive carbon black comprises between 2 or 2.5 and 7.0 weight percent of the total weight of the thermoplastic composition and at least a portion of this carbon black is dispersed within the crystalline polymer. More preferably, the carbon black comprises between 3 and 6 weight percent of the total weight of the composition, wherein more preferably at least 70 percent of the carbon black is dispersed in the crystalline polymer. As a consequence of incorporating the carbon black, and more particularly because at least a portion is incorporated in the crystalline polymer which forms a continuous phase within the polymer blend, a relative low level of carbon black is required to provide sufficient electrical conductivity to the thermoplastic composition for dissipation function. As a result of the relatively minor amount carbon black modification of the polymer blend in this particular way, the internal electrical conductivity of an article made from the composition measured at an applied field of 1 volt is between 10^{-5} S/cm and 10^{-12} S/cm, and the surface conductivity at 100 volts applied electric field is greater than 10^{-18} S/cm. The units of conductivity (Siemens/cm) are conventional units and can also be expressed as reciprocal ohms per centimetre (ohms^{-1}/cm). Hence, as described above, this particular modification of the polymer blend allows for a significant electrical conductivity increase while doing so with a relatively small amount of carbon black to not have a detrimental impact on the chemical/physical properties of the thermoplastic composition. The surface electrical conductivity of unmodified TPO and Xenoy blends is less than 10^{-18} S/cm. This value can be increased to 10^{-15} S/cm upon modification. Typically this value will be 10^{-16} - 10^{-17} for modified materials. The internal, or core, conductivity of these unmodified blends is typically the same as the surface conductivity, or less than 10^{-18} S/cm. Upon modification, this internal value is increased to 10^{-5} - 10^{-12} S/cm. This significant increase in core conductivity is critical for reaching an electrically dissipating moulded part.

[0011] The electrically conductive carbon black incorporated into the polymer blend preferably has a particle size between 20 and 50 nanometers and a pH between 6.5 and 10, wherein the percent volatiles of the carbon black is preferably between 0.2 and 1.5. Generally, and preferably, the pore volume (DBP absorption) of the carbon black is between 150 and 400 cm^3/100g. Examples of electrically conductive carbon blacks useful in this invention are those such as AKZO Chemicals Ketjenblacks EC-300J or EC-600J, and Columbian Chemicals Company Conductex 975U.

[0012] In the present invention, at least a portion of the electrically conductive carbon black is dispersed within the crystalline polymer of the polymer blend. One way to accomplish this is by incorporating the carbon black into the thermoplastic composition in the form of a concentrate of carbon black in the crystalline polymer. Still another way is to add free carbon powder directly to the elasticised blend. When added in concentrate form the majority of the carbon additive is concentrated in the amorphous region of the crystalline component, or stated differently, at the interface of the crystalline polymer and amorphous polymer but largely contained in the crystalline component. When added as a free powder, there is a statistical distribution of the carbon additive within all components, which tends to slightly increase the required concentration.

[0013] As disclosed above, the modified thermoplastic composition of the invention may be made by adding the conductive carbon material to the blend components either in concentrate form or as a free powder. This addition can be performed using a variety of mixing and compounding techniques including Banbury mixers, twin screw extruders, and advance processing compounders or kneader extruders. In these techniques, the materials are blended in order to provide a homogenous blend with the necessary impact modifier dispersion and

domain size. In order to optimally provide the desired conductivity in the final injection moulded or blow moulded part, it is desirable that care be taken in handling the carbon additive. Concentrates should be prepared either in twin screw or single screw extruders with screw profiles which optimise carbon aggregate dispersion without decomposition of aggregate sizes. Free powder addition optimally requires introduction of the electrically conductive carbon downstream in the compounding process, or careful control of the blending shear profiles. One of the preferred methods involves preparing a 15 weight percent concentrate of EC-300J in the crystalline polymer using a twin screw extruder. This concentrate may then be introduced at the correct level with the other components including additional crystalline component on a twin screw extruder or Banbury mixer. It is most preferred that the concentrate not be prepared using high shear techniques as occur with a Banbury mixer. This compounded material is then pelletised, dried, and injection moulded to produce the electrically dissipating part. In another preferred method, dry powder of EC-300J is added directly to the blend ingredients and mixed using any of the above mixing/compounding techniques and pelletised.

[0014] The thermoplastic composition of the invention can be used to make a variety of articles including, but not limited to, automotive fascia, rocker panels, spoilers, or other vehicle exterior or interior trim components. Since the composition has increased electrical conductivity it is particularly useful to make articles, like automotive fascia, which are generally subject to painting. By modifying such thermoplastic materials to have an electrical conductivity, they are ideally suited to make articles which may then be efficiently painted using electrostatic techniques as described above.

[0015] The following examples are meant to describe preferred embodiments of the present invention.

Example 1

[0016] 60 parts by weight polypropylene, 28 parts by weight ethylene-propylene copolymer, and 7 parts by weight high density polyethylene were mixed and metered into a Buss America kneader extruder operated at 250 rpm, 200°C, and at an output rate of 60 lb./hr. 5 parts by weight Ketjenblack® (Akzo Chemicals Inc., Akron, OH) EC-300J, nominal particle size of 30 nm, pH = 9, pore volume = 325 cm^3/100g, percent volatiles = 0.6, and ash content = 0.1 was added downstream to the compounded and plasticised polymer blend. The resulting material was pelletised and 4" x 6" plaques were injection moulded on a 250 tonne Cincinnati Milacron injection moulding unit at a mould temperature of 38°C (100°F), 221°C (430°F) melt temperature, 6.9 MPa (1000 psi) injection pressure, 345 kPa (50 psi) back pressure, and 3 second fill rate. Measured injection moulded material properties were Izod impact = 12.8 ft. lb./in.; Dynatup impact at -30°C = 39.7 joules; and flexural modulus = 735 MPa. The measured carbon content by pyrolysis was determined to be 4.7 to 5.3 weight percent. The steady state surface conductivity was measured as 3.3×10^{-16} S/cm. The internal or core conductivity was measured to be 5.5×10^{-7} S/cm.

Example 2

[0017] Using polypropylene as the concentrate carrier, a 15 weight percent EC-300J carbon concentrate was prepared on a Haake Rheocord 90 twin screw extruder operated at 75 rpm and barrel temperatures ranging between 200 and 230°C by adding a dry mixture of polypropylene pellets and dry carbon powder. This material was pelletised after in a continuous fashion after cooling the extruded strand in a water bath. 28 parts by weight polypropylene, 40 parts by weight EC-300J/polypropylene concentrate, 27 parts by weight ethylene-propylene-diene copolymer, and 5 parts by weight polyethylene hand mixed in dry form and introduced to a Farrel type dual blade Banbury mixer. The materials were then blended at 200 rpm for 3 minutes without external mixing reaching a shear induced temperature of 219°C (410°F). The molten blend was introduced into a single screw extruder for pelletisation. The final pellets were injection moulded using a BOY 50 tonne injection moulding unit. The resulting plaques were evaluated for mechanical and electrical properties. The results were Izod impact 12.24 ft.lb./in.; flexural modulus = 780 MPa; and Dynatup impact at -30°C = 35.6 joules. The surface and internal conductivities were measured to be 8.3×10^{-18} S/cm and 7.7×10^{-8} S/cm, respectively.

Example 3

[0018] Using the same carbon concentrate as in Example 2, 33.3 parts by weight concentrate, 27 parts by weight ethylene-propylene rubber, 5 parts polyethylene, and 34.7 parts by weight polypropylene were compounded using a twin screw extruder. The resulting pelletised material was injection moulded into 25 cm x 50 cm (10" x 20") plaques. The measured surface and internal electrical conductivities were measured to be 2×10^{-17} and 1×10^{-5} S/cm, respectively. No difference in mechanical properties relative to a material formed without the conducting carbon were observed. Electrostatic painting studies showed a 220% increase in film thickness of an applied white base coat relative to the unmodified material.

Example 4

[0019] 26.7 parts by weight of the concentrate 15% EC-300J in polypropylene and 2 parts by weight Conductex® (Columbian, Atlanta, GA) 975U, particle size 21 nm, pore volume 165 cm^3/100g, pH = 7, and percent volatiles = 1.5, were combined with 38.3 parts by weight polypropylene, 28 parts by weight ethylene-propylene

diene copolymer, and 5 parts by weight polyethylene on a twin screw extruder. The resulting blend was pelletized and injection moulded into 10 cm x 15 cm (4" x 6") plaques. The resulting plaques exhibited a surface conductivity of 1.25 x 10^{-17} S/cm and an internal core conductivity of 5.6 x 10^{-6} S/cm.

Example 5

[0020] A 15 weight percent EC-300J concentrate was prepared using polybutylene terephthalate (PBT) powder as the carrier resin. The dried carbon and PBT carrier powders were premixed in dry form and introduced to a low shear profile twin screw extruder operated at 271°C (520°F). 20 parts by weight of the resulting concentrate, 30 parts by weight PBT pellets, 45 parts by weight polycarbonate, and 5 parts by weight of a styrene-butadiene block copolymer were added to a high shear profile twin screw extruder and pelletized. The resulting pellets were injection moulded into 10 cm x 15 cm (4" x 6") plaques. The resulting surface and internal conductivities were measured to be 1.7 x 10^{-17} S/cm and 3.6 x 10^{-6} S/cm, respectively.

Claims

1. The use of an electrically conductive composition comprising a polymer blend of at least two polymers comprising a crystalline polymer and an amorphous or semi-crystalline polymer and electrically conductive carbon black,
characterised in that

   - said polymer blend comprises:

     (i) a crystalline polymer having a melting point above 110°C, and
     (ii) an amorphous or semi-crystalline polymer having a T_g above -80°C and a percent crystallinity between 0 and 20 percent, said crystalline polymer comprising at least 35 percent of said polymer blend and being a continuous phase within said polymer blend; and

   - said electrically conductive carbon comprises between 2 and 7.0 weight percent of the total weight of said composition, at least a portion of said carbon black being dispersed within said crystalline polymer, and that
   - the internal electrical conductivity of said moulded part measured at an applied field of 1 volt is between 10^{-5} S/cm and 10^{-12} S/cm and the steady surface conductivity at 100 volts applied electric field is greater than 10^{-18} s/cm;

   for preparing moulded thermoplastic articles which are electrostatically painted in a further step.

2. The use as claimed in claim 1 wherein said crystalline polymer is selected from the group consisting of polypropylene, polybutylene terephthalate, polyethylene, polyethylene terephthalate, nylon, polyphenylene sulphide, polyether ether ketone, and mixtures thereof.

3. The use as claimed in claim 1 or claim 2 wherein said amorphous polymer is selected from the group consisting of polycarbonate, natural and synthetic polyisoprene rubbers, ethylene-propylene copolymers (EPM), ethylene-propylene diene rubbers (EPDM), chlorinated rubbers, nitrile rubbers, polystyrene, polythenylene oxides, methylmethacrylate styrene-butadiene block copolymers, polyether sulfones, polysulfones, polyacrylates, other impact modifiers, and mixtures thereof.

4. The use as claimed in any preceding claim wherein at least 70 percent of said carbon black is dispersed in said crystalline polymer.

5. The use as claimed in any preceding claim wherein said carbon black has a particle size between 20 and 50 nanometres.

6. The use as claimed in any preceding claim wherein said carbon black has a pH between 6.5 and 10, percent volatiles of between 0.2 and 1.5, and a pore volume between 150 and 400 cm^3/100 g.

7. The use as claimed in any preceding claim, wherein said carbon black is incorporated into said composition in the form of a concentrate in said crystalline polymer.

8. The use as claimed in airy preceding claim, wherein said crystalline polymer has a melting point above 140°C.

9. The use as claimed in any preceding claim, wherein said crystalline polymer comprises from 40 to 70 weight percent of said polymer blend and said carbon black comprises between 3.0 and 6.0 weight percent of the total weight of said composition.

10. The use as claimed in claim 9, wherein said crystalline polymer comprises at least 60 weight percent of said polymer blend and the internal electrical conductivity of said moulded part measured at an applied field of 1 volt is between 10^{-5} S/cm and 10^{-10} S/cm and the steady surface conductivity at 100 volts applied electric field is greater than 10^{-17} S/cm.

11. A moulded thermoplastic article made of a composition as set forth in any preceding claim, when elec-

trostatically painted.

Patentansprüche

1. Die Anwendung einer elektrisch leitfähigen Zusammensetzung, die eine Polymermischung aus mindestens zwei Polymeren umfaßt; die ein kristallines Polymer und ein amorphes oder halbkristallines Polymer und elektrisch leitfähigen Ruß einschließt; dadurch gekennzeichnet, daß

   - diese Polymermischung umfasst:

     (i) ein kristallines Polymer, das einen Schmelzpunkt oberhalb 110°C besitzt, und (ii) ein amorphes oder halbkristallines Polymer, das eine T_G oberhalb von -80°C und eine prozentuale Kristallinität zwischen 0 und 20 Prozent besitzt, wobei dieses kristalline Polymer mindestens 35 Prozent dieser Polymermischung umfaßt und innerhalb dieser Polymermischung eine kontinuierliche Phase darstellt; und

   - dieser elektrisch leitfähige Kohlenstoff zwischen 2 und 7,0 Gewichtsprozent des Gesamtgewichts dieser Zusammensetzung umfaßt, mindestens ein Anteil dieses Rußes innerhalb dieses kristallinen Polymers dispergiert ist, und daß
   - die innere elektrische Leitfähigkeit dieses geformten Teils - gemessen bei einem angelegten Feld von 1 Volt- zwischen 10^{-5} S/cm und 10^{-12} S/cm beträgt, und die Gleichgewichts-Oberflächenleitfähigkeit - bei einem angelegten Feld von 100 Volt - größer als 10^{-18} S/cm ist;

   zur Herstellung geformter, thermoplastischer Gegenstände, welche in einem weiteren Schritt elektrostatisch lackiert werden.

2. Die Anwendung nach Anspruch 1, in der dieses kristalline Polymer aus der aus Polypropylen, Polybutylen-Terephtalat, Polyethylen, Polyethylen-Terephtalat, Nylon, Polyphenylensulfid, Polyether-Ether-Keton und Mischungen hieraus bestehenden Gruppe gewählt wird.

3. Die Anwendung nach Anspruch 1 oder Anspruch 2, in der dieses amorphe Polymer aus der aus Polycarbonat, natürlichem und synthethischen Polyisopren-Kautschuk, Ethylen-Propylen-Copolymeren (EPM), Ethylen-Propylen-Dien-Kautschuke (EPDM), chlorierte Kautschuke, Nitrilkautschuke, Polystyren, Polyethylenoxiden, Methylmethacrylat-Styren-Butadien-Block-Copolymeren, Polyethersulfonen, Polysulfonen, Polyacrylaten, anderen Schlagzähigkeits-Zusätzen und Mischungen hieraus bestehenden Gruppe besteht.

4. Die Anwendung nach einem der vorstehenden Ansprüche, in der wenigstens 70 Prozent dieses Rußes in diesem kristallinen Polymer dispergiert sind.

5. Die Anwendung nach einem der vorstehenden Ansprüche, in der dieser Ruß eine Teilchengröße zwischen 20 und 50 Nanometern besitzt.

6. Die Anwendung nach einem der vorstehenden Ansprüche, in der dieser Ruß einen pH zwischen 6,5 und 10, einen prozentualen Anteil an flüchtigen Bestandteilen zwischen 0,2 und 1,5, und ein Porenvolumen zwischen 150 und 400 $cm^3/100$ g aufweist.

7. Die Anwendung nach einem der vorstehenden Ansprüche, in der dieser Ruß in der Form eines Konzentrates in diesem kristallinen Polymer in diese Zusammensetzung inkorporiert wird.

8. Die Anwendung nach einem der vorstehenden Ansprüche, in der dieses kristalline Polymer einen Schmelzpunkt von über 140°C besitzt.

9. Die Anwendung nach einem der vorstehenden Ansprüche, in der dieses kristalline Polymer 40 bis 70 Gewichtsprozent dieser Polymermischung umfaßt, und dieser Ruß zwischen 3,0 und 6,0 Gewichtsprozent des Gesamtgewichts dieser Zusammensetzung umfaßt.

10. Die Anwendung nach Anspruch 9, in der dieses kristalline Polymer mindestens 60 Gewichtsprozent dieser Polymermischung umfaßt und die innere elektrische Leitfähigkeit dieses geformten Teils - gemessen bei einem angelegten Feld von 1 Volt- zwischen 10^{-5} S/cm und 10^{-10} S/cm beträgt, und die Oberflächenleitfähigkeit - bei einem angelegten Feld von 100 Volt - größer als 10^{-17} S/cm ist.

11. Ein geformter, thermoplastischer Gegenstand, der aus einer wie in einem der vorstehenden Ansprüchen ausgeführten Zusammensetzung hergestellt wurde, wenn er elektrostatisch lackiert wird.

Revendications

1. Utilisation d'une composition électroconductrice comprenant un mélange de polymères constitué d'au moins deux polymères comprenant un polymère cristallin et un polymère amorphe ou semi-cristallin et du noir de carbone électroconducteur, caractérisée en ce que

   - ledit mélange de polymères comprend :

(i) un polymère cristallin ayant un point de fusion au-dessus de 110°C, et
(ii) un polymère semi-cristallin ou amorphe ayant une température de transition vitreuse Tg supérieure à -80°C et un taux de cristallinité compris entre 0 et 20%, ledit polymère cristallin constituant au moins 35% dudit mélange de polymères et formant une phase continue au sein dudit mélange de polymères; et

- ledit noir de carbone électroconducteur comprend entre 2 et 7,0% en poids du poids total de ladite composition, étant précisé qu'au moins une partie dudit noir de carbone se trouve dispersée au sein dudit polymère cristallin, et en ce que
- la conductivité électrique interne de ladite pièce moulée telle que mesurée en appliquant un champ électrique de 1 volt, est comprise entre 10^{-5} S/cm et 10^{-12} S/cm, et la conductivité de surface, telle que mesurée en régime stabilisé en appliquant un champ électrique de 100 volts, est supérieure à 10^{-18} S/cm;

pour la préparation d'articles thermoplastiques moulés qui sont peints par voie électrostatique au cours d'une étape ultérieure.

2. Utilisation selon la revendication 1, dans laquelle ledit polymère cristallin est choisi dans le groupe consistant en le polypropylène, le polytéréphtalate de butylène, le polyéthylène, le polytéréphtalate d'éthylène, le Nylon, le sulfure de polyphénylène, la polyétheréthercétone, et leurs mélanges.

3. Utilisation selon la revendication 1 ou la revendication 2, dans laquelle ledit polymère amorphe est choisi dans le groupe consistant en le polycarbonate, les caoutchoucs en polyisoprène synthétiques et naturels, les copolymères d'éthylène-propylène (EPM), les caoutchoucs en éthylène-propylène-diène (EPDM), les caoutchoucs chlorés, les caoutchoucs nitrilés, le polystyrène, les polyphénylène-oxydes, les copolymères séquencés de méthacrylates de méthyle-styrène-butadiène, les polyéthersulfones, les polysulfones, les polyacrylates, d'autres agents antichocs et les mélanges correspondants.

4. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle au moins 70% dudit noir de carbone se trouvent dispersés dans ledit polymère cristallin.

5. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle ledit noir de carbone présente une granulométrie de 20 à 50 nanomètres.

6. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle ledit noir de carbone présente un pH compris entre 6,5 et 10, un pourcentage de matières volatiles compris entre 0,2 et 1,5, et un volume poreux compris entre 150 et 400 cm^3/100 g.

7. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle ledit noir de carbone est incorporé dans ladite composition sous forme d'un concentré dans ledit polymère cristallin.

8. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle ledit polymère cristallin présente un point de fusion supérieur à 140°C.

9. Utilisation selon l'une quelconque des revendications précédentes, dans laquelle ledit polymère cristallin constitue de 40 à 70% en poids dudit mélange de polymères et ledit noir de carbone constitue de 3,0 à 6,0% en poids du poids total de ladite composition.

10. Utilisation selon la revendication 9, dans laquelle ledit polymère cristallin constitue au moins 60% en poids dudit mélange de polymères et la conductivité électrique interne de ladite pièce moulée, telle que mesurée en appliquant un champ électrique de 1 volt, est comprise entre 10^{-5} S/cm et 10^{-10} S/cm et la conductivité de surface, telle que mesurée en régime stabilisé en appliquant un champ électrique de 100 volts, est supérieure à 10^{-17} S/cm.

11. Article thermoplastique moulé élaboré à partir d'une composition telle que définie dans l'une quelconque des revendications précédentes, lorsqu'il est peint électrostatiquement.